

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A network system operable to forward data within a computer network, the network system comprising:

a first router having a plurality of first virtual logical interfaces ~~corresponding~~ configurable to correspond selectively to one or more physical ports of the network device system, the first router being configured to enable the first virtual logical interfaces when the first router is assigned to be a designated router and to disable the first virtual logical interfaces when the first router is not assigned to be a designated router;

a second router having a plurality of second virtual logical interfaces ~~corresponding~~ configurable to correspond selectively to one or more physical ports of the network device system, the second router being configured to enable the second virtual logical interfaces when the second router is assigned to be a designated router and to disable the second virtual logical interface when the second router is not assigned to be a designated router; and

a supervisor module configured to assign a selected one of the first and second routers to be a designated router,

wherein each first virtual interface of the first router has a same internet protocol (IP) address and media access control (MAC) address as each corresponding second virtual interface of the second router.

2. (currently amended) A network system as recited in claim 1, wherein

the first router is further configured to inform the second router about any change in a configuration of its first virtual interfaces when it is assigned as the designated router and to change the configuration of its first virtual interfaces to correspond to a change in configuration of the second virtual interfaces when it is not assigned as the designated router and the second router informs the first router of such a change in the configuration

of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces, and

the second router is further configured to inform the first router about any change in the configuration of its second virtual interfaces when it is assigned as the designated router and to change the configuration of its second virtual interfaces to correspond to a change in state of the first virtual interfaces when it is not assigned as the designated router and the first router informs the second router of such a change in the configuration of the second virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces as the second virtual interfaces.

3. (currently amended) A network system as recited in claim 2, further comprising a control bus for managing the first and second router and the supervisor module and a data bus through which data is received and transmitted into and out of the physical ports of the network device system.

4. A network system as recited in claim 2, wherein the supervisor module is further configured to poll the currently assigned designated router to determine whether the designated router has failed and when the designated router has failed, to assign another of the routers to be a designated router.

5. (currently amended) A network system as recited in claim 2, wherein the first router is further configured to enable the first virtual interfaces by setting a link state of each first virtual interface to an “up” up value state and to disable the first virtual interfaces by setting a link state associated with each first virtual interface to a “down” down value state, and

the second router is further configured to enable the second virtual interfaces by setting a link state of each second virtual interface to an “up” up value state and to disable the second virtual interfaces by setting a link state associated with each second virtual interface to a “down” down value state.

6. (currently amended) A network system as recited in claim 5, the first and second virtual interfaces each have an associated administrative state that may be operable to be set by a user or the supervisor module to an “up” up or “down” down state to thereby enable or disable, respectively, the each virtual interface, wherein the first and second routers are both each configured to maintain the same values states for their virtual interface’s administrative states as the other router, and wherein each first and second virtual interface are only enabled when its corresponding link state and administrative state both have an up state.

7. (currently amended) A network system as recited in claim 6, wherein

the first router is further configured to communicate to the second router a change of an administrative state of a selected first virtual interface to a “down” down value when the first router is assigned as the designated router and to change the administrative state of the selected first virtual interface to a “down” down state when the second router communicates that its corresponding second virtual interface’s administrative state has been changed to a “down” down state, and

the second router is further configured to communicate to the first router a change of an administrative state of a selected second virtual interface to a “down” down value state when the second router is assigned as the designated router and to change the administrative state of the selected second virtual interface to a “down” down state when the first router communicates that its corresponding first virtual interface’s administrative state has been changed to a “down” down state.

8. (currently amended) A network system as recited in claim 5, wherein

the first router is further configured to enable a selected first virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected first virtual interface is created in the supervisor module, a link state of the selected first virtual interface being enabled by setting a corresponding link state to “up” up, when the first router is assigned as the designated router, and

the second router is further configured to enable a selected second virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected second virtual interface is created in the supervisor module, a link state of the selected second virtual interface being enabled by setting a corresponding link state to “up” up, when the second router is assigned as the designated router.

9. (currently amended) A network system as recited in claim 8, wherein the first router is configured to enable the selected first virtual interface after the first router is informed that the new VLAN has been created and the second router is configured to enable the second first virtual interface after the second router is informed that the new VLAN has been created.

10. (currently amended) A network system as recited in claim 1, further comprising a plurality of virtual interface modules for interfacing with a plurality of physical ports, wherein the first and second virtual interfaces of the first and second routers, respectively, each correspond to one or more of the physical ports.

11. A network system as recited in claim 1, wherein the supervisor module is configured with a plurality of VLAN's that each correspond to one or more physical ports.

12. A network system as recited in claim 1, wherein the first router and the second router are each configured to provide layer 3 switching when it is assigned as a designated router, and the supervisor module is configured to provide layer 2 switching.

13. A network system as recited in claim 1, wherein the first and second router appear together as a single router to other neighboring routers within the computer network.

14. A network system as recited in claim 1, wherein the supervisor module includes a first slot in which the first router is coupled and a second slot in which the second router is coupled.

15. A router redundancy system comprising:

a first network system as recited in claim 1 configured with a hot standby protocol; and

a second network system as recited in claim 1 configured with a hot standby router protocol,

wherein the first and second network systems are configured to act as an active router and a standby router within a hot standby router protocol group.

16. (currently amended) A method for providing data forwarding redundancy with a first router having a plurality of first logical virtual interfaces corresponding configurable to selectively correspond to one or more physical ports of a network device, a second router having a plurality of first logical second virtual interfaces corresponding to one or more physical ports of the network device, and a supervisor module, the method comprising:

configuring each pair of the first and second virtual interfaces with a same

IP and MAC address;

assigning a selected one of the first and second routers to be a designated router;

configuring the first virtual interfaces to correspond to one or more selected physical ports, enabling the first logical virtual interfaces, and informing the second router of the selected one or more ports that correspond to the first virtual interface when the first router is assigned to be a designated router;

configuring the second virtual interfaces to correspond to one or more selected physical ports, enabling the second logical virtual interfaces, and informing the first router of the selected one or more ports that correspond to the second virtual interface when the second router is assigned to be a designated router;

disabling the first logical virtual interfaces when the first router is not assigned to be a designated router; and

disabling the second logical virtual interfaces when the second router is not assigned to be a designated router.

17. (currently amended) A method as recited in claim 16, further comprising:

informing the second router about any change in a configuration of the first router's first virtual interfaces when the first router is assigned as the designated router;

changing the configuration of the first router's first virtual interfaces to correspond to a change in a configuration of the second virtual interfaces when the first router is not assigned as the designated router and the first router is informed of a change in the configuration of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces,

informing the first router about any change in the configuration of the second router's second virtual interfaces when the second router is assigned as the designated router; and

changing the configuration of the second router's second virtual interfaces to correspond to a change in the configuration of the first virtual interfaces when the second router is not assigned as the designated router and the second router is informed of such a change in a state of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces.

18. A method as recited in claim 17, further comprising managing the first and second router and the supervisor module through a control bus of the network system and receiving and transmitting data into and out of the physical ports of the network device and through a data bus of the network device.

19. A method as recited in claim 17, further comprising polling the currently assigned designated router to determine whether the designated router has failed and when the designated router has failed, assigning another of the routers to be a designated router.

20. (currently amended) A method as recited in claim 17, wherein

enabling the first virtual interfaces is accomplished by setting a link state of each first virtual interface to an “up” up value state and disabling the first virtual interfaces is accomplished by setting a link state associated with each first virtual interface to a “down” down value state, and

enabling the second virtual interfaces is accomplished by setting a link state of each second virtual interface to an “up” up value state and disabling the second virtual interfaces is accomplished by setting a link state associated with each second virtual interface to a “down” down value state.

21. (currently amended) A method as recited in claim 20, the first and second virtual interfaces each have an associated administrative state that may is operable to be set by a user or the supervisor module to an “up” up or “down” down state to thereby enable or disable, respectively, the each virtual interface, the method further comprising each of the first and second router maintaining the same values for their virtual interface’s administrative states as the other router, and wherein each first and second virtual interface are only enabled when its corresponding link state and administrative state both have an up state.

22. (currently amended) A method as recited in claim 21, further comprising:

communicating to the second router a change of an administrative state of a selected first virtual interface to a “down” down value when the first router is assigned as the designated router and changing the administrative state of the selected first virtual interface to a “down” down state when the second router communicates that its corresponding second virtual interface’s administrative state has been changed to a “down” down state, and

communicating to the first router a change of an administrative state of a selected second virtual interface to a “down” down value when the second router is assigned as the designated router and changing the administrative state of the selected second virtual interface to a “down” down state when the first router communicates that its corresponding first virtual interface’s administrative state has been changed to a “down” down state.

23. (currently amended) A method as recited in claim 20, further comprising:

enabling a selected first virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected first virtual interface is created in the supervisor module, a link state of the selected first virtual interface being enabled by setting a corresponding link state to “up” up, when the first router is assigned as the designated router, and

enabling a selected second virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected second virtual interface is created in the supervisor module, a link state of the selected second virtual interface being enabled by setting a corresponding link state to “up” up, when the second router is assigned as the designated router,

24. (currently amended) A method as recited in claim 23, wherein the selected first virtual interface is enabled after the first router is informed that the new VLAN has been created and the second first virtual interface is enabled after the second router is informed that the new VLAN has been created.

25. A method as recited in claim 16, wherein the supervisor module is configured with a plurality of VLAN’s that each correspond to one or more physical ports.

26. A method as recited in claim 16, wherein the first router and the second router are each configured to provide layer 3 switching when it is assigned as a designated router, and the supervisor module is configured to provide layer 2 switching.

27. A method as recited in claim 16, wherein the first and second router appear together as a single router to other neighboring routers within the computer network.

28. A method as recited in claim 16, wherein the supervisor module includes a first slot in which the first router is coupled and a second slot in which the second router is coupled.

29. (currently amended) A computer program product for providing data forwarding redundancy with a first router having a plurality of first logical virtual interfaces corresponding to one or more physical ports of a network device, a second router having a plurality of second first logical virtual interfaces corresponding to one or more physical ports of the network device, and a supervisor module, the computer program product comprising:

at least one computer readable medium;
computer program instructions stored within the at least one computer readable product configured to cause a network device to:

configure each pair of the first and second virtual interfaces with a same IP and MAC address;

assign a selected one of the first and second routers to be a designated router;

configure the first virtual interfaces to correspond to one or more selected physical ports, enable the first logical virtual interfaces, and inform the second router of the selected one or more ports that correspond to the first virtual interface
when the first router is assigned to be a designated router;

configure the second virtual interfaces to correspond to one or more selected physical ports, enable the second logical virtual interfaces, and inform the first router of the selected one or more ports that correspond to the second virtual interface
when the second router is assigned to be a designated router;

disable the first logical virtual interfaces when the first router is not assigned to be a designated router; and

disable the second logical virtual interfaces when the second router is not assigned to be a designated router.

30. A computer program product as recited in claim 29, the at least one computer readable product further configured to cause a network device to:

inform the second router about any change in a configuration of the first router's first virtual interfaces when the first router is assigned as the designated router;

change the configuration of the first router's first virtual interfaces to correspond to a change in a configuration of the second virtual interfaces when the first router is not assigned as the designated router and the first router is informed of a change in the configuration of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces,

inform the first router about any change in the configuration of the second router's second virtual interfaces when the second router is assigned as the designated router; and

change the configuration of the second router's second virtual interfaces to correspond to a change in the configuration of the first virtual interfaces when the second router is not assigned as the designated router and the second router is informed of such a change in a state of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces.

31. (currently amended) A computer program product as recited in claim 30, wherein the at least one computer readable product further configured to cause a network device to poll the currently assigned designated router to determine whether the designated router has failed and when the designated router has failed, assigning another of the routers to be a designated router.

32. (currently amended) A computer program product as recited in claim 30, wherein

enable the first virtual interfaces is accomplished by setting a link state of each first virtual interface to an “up” up value state and disabling the first virtual interfaces is accomplished by setting a link state associated with each first virtual interface to a “down” down value state, and

enable the second virtual interfaces is accomplished by setting a link state of each second virtual interface to an “up” up value state and disabling the second virtual interfaces is accomplished by setting a link state associated with each second virtual interface to a “down” down value state.

33. (currently amended) A computer program product as recited in claim 32, wherein the first and second virtual interfaces each have an associated administrative state that is operable to may be set by a user or the supervisor module to an “up” or “down” state to thereby enable or disable, respectively, the each virtual interface, the method and wherein the at least one computer readable product further configured to further comprising at each of the first and second router maintain the same values for their virtual interface’s administrative states as the other router, and wherein each first and second virtual interface are only enabled when its corresponding link state and administrative state both have an up state.

34. (currently amended) A computer program product as recited in claim 33, the at least one computer readable product further configured to cause a network device to:

communicate to the second router a change of an administrative state of a selected first virtual interface to a “down” down value when the first router is assigned as the designated router and changing the administrative state of the selected first virtual interface to a “down” down state when the second router communicates that its corresponding second virtual interface’s administrative state has been changed to a “down” down state, and

communicate to the first router a change of an administrative state of a selected second virtual interface to a “down” down value when the second router is assigned as the designated router and changing the administrative state of the selected second virtual interface to a “down” down state when the first router communicates that its corresponding first virtual interface’s administrative state has been changed to a “down” down state.

35. (currently amended) A computer program product as recited in claim 32, the at least one computer readable product further configured to cause a network device to:

enable a selected first virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected first virtual interface is created in the supervisor module, a link state of the selected first virtual interface being enabled by setting a corresponding link state to “up” up, when the first router is assigned as the designated router, and

enable a selected second virtual interface when a new virtual local area network (VLAN) that corresponds to one or more physical ports and the selected second virtual interface is created in the supervisor module, a link state of the selected second virtual interface being enabled by setting a corresponding link state to “up” up, when the second router is assigned as the designated router.

36. A computer program product as recited in claim 29, wherein the first and second router appear together as a single router to other neighboring routers within the computer network.

37. (currently amended) An apparatus for providing data forwarding redundancy with a first router having a plurality of first logical virtual interfaces corresponding configurable to selectively correspond to one or more physical ports of a network device, a second router having a plurality of first logical second virtual interfaces corresponding to one or more physical ports of the network device, and a supervisor module, the apparatus comprising:

means for configuring each pair of the first and second virtual interfaces with a same IP and MAC address;

means for assigning a selected one of the first and second routers to be a designated router;

means for configuring the first virtual interfaces to correspond to one or more selected physical ports, enabling the first logical virtual interfaces, and informing the second router of the selected one or more ports that correspond to the first virtual interface when the first router is assigned to be a designated router;

means for configuring the second virtual interfaces to correspond to one or more selected physical ports, enabling the second logical virtual interfaces, and informing the first router of the selected one or more ports that correspond to the second virtual interface when the second router is assigned to be a designated router;

means for disabling the first logical virtual interfaces when the first router is not assigned to be a designated router; and

means for disabling the second logical virtual interfaces when the second router is not assigned to be a designated router.

38. An apparatus as recited in claim 46 37, further comprising:

means for informing the second router about any change in a configuration of the first router's first virtual interfaces when the first router is assigned as the designated router;

means for changing the configuration of the first router's first virtual interfaces to correspond to a change in a configuration of the second virtual interfaces when the first router is not assigned as the designated router and the first router is informed of a change in the configuration of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces,

means for informing the first router about any change in the configuration of the second router's second virtual interfaces when the second router is assigned as the designated router; and

means for changing the configuration of the second router's second virtual interfaces to correspond to a change in the configuration of the first virtual interfaces when the second router is not assigned as the designated router and the second router is informed of such a change in a state of the first virtual interfaces so that the first virtual interfaces have a same number and configuration as the second virtual interfaces.